

WHAT IS CLAIMED IS:

1. A method for mounting a component, comprising the steps of:

recognizing a bad mark which is indicated on a circuit-formed substrate when each of at least one individual substrate provided by sectioning the circuit-formed substrate includes a defective individual substrate, and an individual substrate mark which is provided on the circuit-formed substrate so as to recognize the position and the inclination of said at least one individual substrate; and

mounting a component on said circuit-formed substrate, aiming at an individual substrate having no bad mark indicated;

wherein said bad mark is indicated on said individual substrate mark.

2. A method for mounting a component, comprising the steps of:

recognizing the condition of a sucked component which is fed by a component-feeding device, sucked and taken out;

recognizing the condition of a secured circuit-formed substrate which is carried, regulated and secured;

recognizing the position and the inclination of at least one individual substrate provided by sectioning the

circuit-formed substrate;

calculating correction amounts for the position and inclination of the component to be mounted, based on the result of the recognition of the component-sucking condition, the result of the recognition of the circuit-formed substrate-securing condition, and the result of the recognition of the position and inclination of said individual substrate; and

making necessary correction on the component based on the result of said calculation and mounting the component at a predetermined position on the individual substrate;

wherein a mark provided on said individual substrate so as to recognize the position and inclination of the individual substrate is used also as a bad mark for discriminating a defective individual substrate.

3. The method according to claim 2, wherein said bad mark is indicated by coloring the individual substrate mark of an individual substrate which is judged as a defective before mounting a component.

4. A method for mounting a component, comprising the steps of:

recognizing the condition of a sucked component which is fed from a component-feeding unit, sucked and taken out,

recognizing the condition of a secured circuit-formed substrate which is carried, regulated and secured;

recognizing the position and inclination of at least one individual substrate provided by sectioning the 5 circuit-formed substrate;

calculating correction amounts for the position and inclination of the component to be mounted, based on the results of the recognition of the component-sucking condition, the circuit-formed substrate-securing condition, 10 and the position and inclination of the individual substrate; and

making necessary correction on the component based on the result of said calculation, and mounting the component at a predetermined position on the individual substrate;

15 wherein a position at which a substrate-recognition camera should recognize the position and inclination of said individual substrate is controlled based on the result of the recognition of the circuit-formed substrate-securing condition.

20 5. A method for mounting a component, comprising the steps of:

recognizing the condition of a sucked component which is fed from a component-feeding unit, sucked and taken out;

25 recognizing the condition of a secured circuit-formed

substrate which is carried, regulated and secured;

recognizing the position and inclination of at least one individual substrate provided by sectioning the circuit-formed substrate;

5 calculating correction amounts for the position and inclination of the component to be mounted, based on the results of the recognition of the component-sucking condition, the circuit-formed substrate-securing condition, and the position and inclination of the individual substrate; and

10 making necessary correction on the component based on the result of said calculation, and mounting the component at a predetermined position on the individual substrate;

15 wherein, when a portion or a whole of a mark provided on the circuit-formed substrate so as to recognize the circuit-formed substrate-securing condition, or a mark provided on the individual substrate so as to recognize the condition of the individual substrate is not included within the visual field of a substrate-recognition camera 20 for recognizing these marks, the position of said mark is detected and said mark is again recognized.

25 6. The method according to claim 5, wherein the position of said mark is detected based on a portion of said mark captured within the visual field of the

substrate-recognition camera, and said mark is again recognized by moving the visual field of the substrate-recognition camera to the detected position.

5 7. The method according to claim 5, wherein the position of said mark is detected by enlarging the visual field of the substrate-recognition camera, and said mark is again recognized.

10 8. A component-mounting apparatus comprising:
a component-feeding unit for feeding a component to be mounted;
a mounting head for taking the component out of the component-feeding unit and mounting it on a circuit-formed substrate;
a component-recognition camera for recognizing the condition of the component held by the mounting head;
an X-Y robot for carrying the mounting head to a predetermined position;
20 a circuit-formed substrate-securing device for carrying and securing the circuit-formed substrate;
a substrate-recognition camera for recognizing the condition of the secured circuit-formed substrate; and
a control unit for controlling the overall operations
25 of the apparatus;

wherein said substrate-recognition camera recognizes an individual substrate mark which is provided on each of at least one individual substrate provided by sectioning the circuit-formed substrate so as to recognize the 5 position and inclination of the individual substrate; correction amounts for the position and inclination of the component to be mounted are calculated based on the result of the recognition of the individual substrate mark, the result of the recognition of the component-holding 10 condition by the component-recognition camera, and the result of the recognition of the circuit-formed substrate-securing condition by the substrate-recognition camera so as to make necessary correction on the component; and the mounting head is carried by the X-Y robot so as to mount 15 the component at a predetermined position on the individual substrate;

wherein a bad mark to be indicated when the circuit-formed substrate includes a defective individual substrate is put on the individual substrate mark of the defective 20 individual substrate so that the substrate-recognition camera can recognize the bad mark at the same time when recognizing the individual substrate mark.

9. A component-mounting apparatus comprising:
25 a component-feeding unit for feeding a component to be

mounted;

a mounting head for taking the component out of the component-feeding unit and mounting it on a circuit-formed substrate;

5 a component-recognition camera for recognizing the condition of the component held by the mounting head;

an X-Y robot for carrying the mounting head to a predetermined position;

10 a circuit-formed substrate-securing device for carrying and securing the circuit-formed substrate;

a substrate-recognition camera for recording and recognizing the condition of the secured circuit-formed substrate; and

15 a control unit for controlling the overall operations of the apparatus;

wherein said substrate-recognition camera recognizes an individual substrate mark which is provided on each of at least one individual substrate provided by sectioning the circuit-formed substrate so as to recognize the 20 position and inclination of the individual substrate; correction amounts for the position and inclination of the component to be mounted are calculated based on the result of the recognition of the individual substrate mark, the result of the recognition of the component-holding 25 condition by the component-recognition camera, and the

result of the recognition of the circuit-formed substrate-securing condition by the substrate-recognition camera so as to make necessary correction on the component; and the mounting head is carried by the X-Y robot so as to mount 5 the component at a predetermined position on the individual substrate,

wherein a position at which the substrate-recognition camera should recognize the individual substrate mark is controlled based on the result of the recognition of the 10 circuit-formed substrate-securing condition.

10. A component-mounting apparatus comprising:

a component-feeding unit for feeding a component to be mounted;

15 a mounting head for taking the component out of the component-feeding unit and mounting it on a circuit-formed substrate;

a component-recognition camera for recognizing the condition of the component held by the mounting head;

20 an X-Y robot for carrying the mounting head to a predetermined position;

a circuit-formed substrate-securing device for carrying and securing the circuit-formed substrate;

25 a substrate-recognition camera for recording and recognizing the condition of the secured circuit-formed

substrate; and

a control unit for controlling the overall operations of the apparatus;

wherein said substrate-recognition camera recognizes
5 an individual substrate mark which is provided on each of
at least one individual substrate provided by sectioning
the circuit-formed substrate so as to recognize the
position and inclination of the individual substrate;
correction amounts for the position and inclination of the
10 component to be mounted are calculated based on the result
of the recognition of the individual substrate mark, the
result of the recognition of the component-holding
condition by the component-recognition camera, and the
result of the recognition of the circuit-formed substrate-
securing condition by the substrate-recognition camera so
15 as to make necessary correction on the component; and the
mounting head is carried by the X-Y robot so as to mount
the component at a predetermined position on the individual
substrate,

20 wherein, when a portion or a whole of a reference mark
provided on the circuit-formed substrate for recognizing
the circuit-formed substrate-securing condition, or an
individual substrate mark is not included within the visual
field of the substrate-recognition camera, the substrate-
25 recognition camera detects the position of said mark and

again recognizes said mark.

11. The apparatus according to claim 10, wherein the position of said mark is detected based on a portion of
5 said mark captured within the visual field of the substrate-recognition camera, and said mark is again recognized by moving the visual field of the substrate-recognition camera to the detected position.

10 12. The apparatus according to claim 10, wherein the position of said mark is detected by enlarging the visual field of the substrate-recognition camera, and the detected mark is again recognized.

THE GOVERNMENT OF THE UNITED STATES OF AMERICA AS REPRESENTED BY THE SECRETARY OF THE AIR FORCE, HAS GRANTED A PATENT TO THE UNITED STATES OF AMERICA AS REPRESENTED BY THE SECRETARY OF THE AIR FORCE, FOR THE INVENTION OF A SYSTEM FOR AUTOMATIC POSITIONING OF A SUBSTRATE, AS SET FORTH IN THE DRAWINGS AND SPECIFICATION.